Historical Summary of Reported New Cases of Notifiable Diseases and Incidence per 100,000 Population, Guam 1968-2018

Ann Pobutsky, PhD – Territorial Epidemiologist, Guam Department of Public Health and Social Services

Stephanie O'Connor – Emory University intern, Guam Department of Public Health and Social Services

Stephanie Kern-Allely, MPH – CSTE Applied Epidemiology Fellow, Guam Department of Public Health and Social Services

Grace Valencia – CDC Coordinator I, Epidemiology and Laboratory Capacity Program, Guam Department of Public Health and Social Services

Office of Epidemiology and Research
Government of Guam
Department of Public Health and Social Services
123 Chalan Kareta, Mangilao, Guam 96913
Telephone: (671) 735-7283
Email: ann.pobutsky@dphss.guam.gov

Background

The purpose of this report is to provide the community with a historical summary of reported cases of the notifiable infectious diseases on Guam based on available data for the period 1968-2018. The overall intent is to illustrate any discernable patterns in infectious diseases over the past 50 years, as well as examine recent trends.

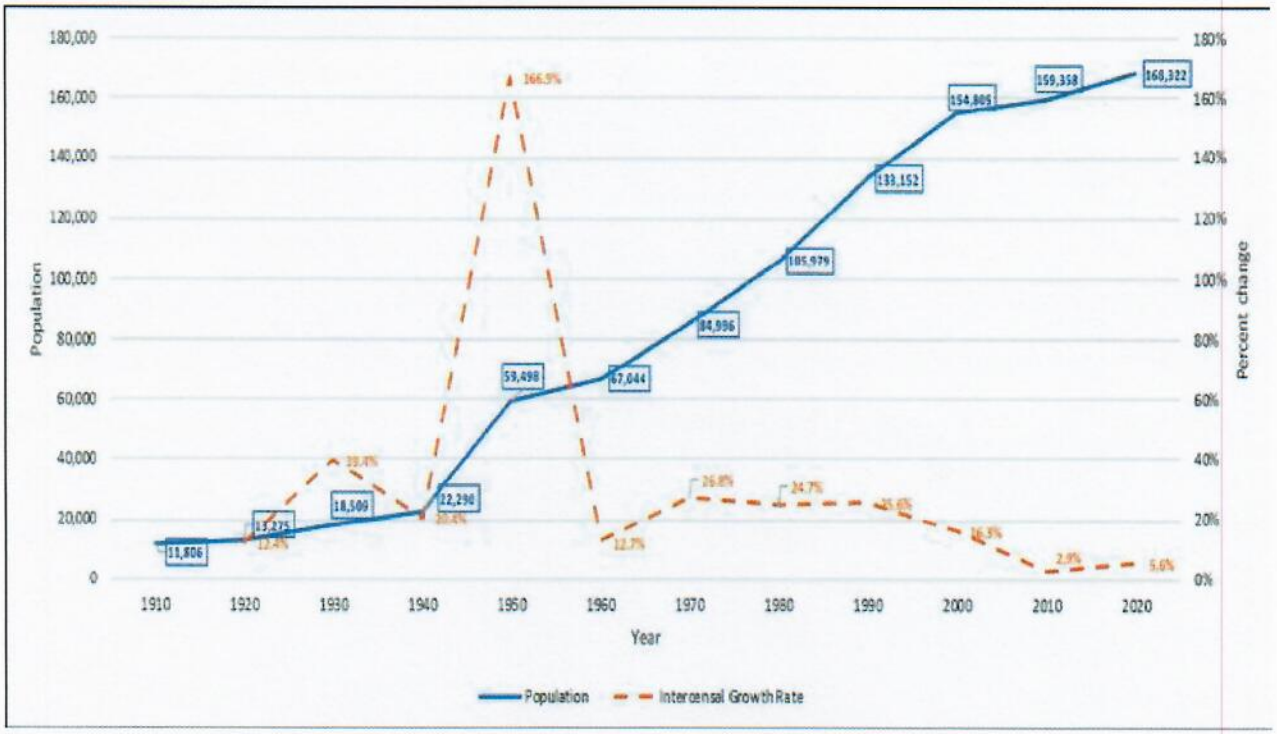
The U.S. unincorporated territory of Guam in the Western Pacific had an estimated population of 165,777 in 2018, which was 41.1% Chamorro, 29% Filipino, 7.8% Chuukese (from the Federated States of Micronesia), 7.8% White, 5.5% other Pacific Islanders (mainly other Micronesians), and 8.7% other groups. Guam's population included approximately 12,000 active-duty military personnel and their dependents in 2010, as well as numerous other military personnel who are being deployed elsewhere and come to Guam for short stays in transit; Guam's military population estimate for 2018 is approximately 15,000 military personnel and their dependents. Guam has a slightly higher proportion of males (51%) than females (49%).

Guam's population has more than doubled since 1960 (Figure 1). However, the rate of growth has slowed dramatically since the turn of the century. A population increase barely registered between the 2000 and 2010 censuses, at just 0.36% growth (Table 1).

Guam's population has steadily increased not only as a result of natural increase (high fertility rates), but from continued immigration of Filipinos, who were recruited as skilled laborers to rebuild the island in large numbers beginning after the war. Guam has also experienced increased in-migration from the Federated States of Micronesia (mainly Chuuk), as well as from other U.S. Affiliated Pacific Islands (USAPI, e.g. the Republic of Palau), that intensified after the Compact of Free Association (COFA) established that residents of the USAPI could travel freely throughout the U.S. Not only do immigrants from the Philippines and migrants from the USAPI come to Guam, but many people travel back and forth to their home island or country. The Philippines and the USAPI regions have high rates of infectious diseases that impacted Guam in the past and will continue to do so in the future.

Guam's main infectious disease challenges include: sexually transmitted diseases, tuberculosis, Hansen's disease, multi-drug resistant infections (mainly MRSA), as well as increased risk for arboviral diseases, which are endemic in numerous countries in the Asia-Pacific region (i.e. dengue fever). Hepatitis B and C are also known problems, but the data have not been verified for accuracy in the annual summaries and in the current Hepatitis Registry. Guam also has high rates of streptococcal sore throat, pertussis, shigellosis, leptospirosis, conjunctivitis, and scabies.

Figure 1. Population of Guam and Intercensal Growth Rate, 1910-2010 and 2020 Estimate



Methods

All data were compiled from hard and electronic copies of existing morbidity reports from the Annual Summary of Notifiable Diseases from 1968-2018, Guam DPHSS, Office of Epidemiology and Research. These are new cases of infectious diseases that are reported to the Centers for Disease Control and Prevention each year through the National Notifiable Diseases Surveillance System (CDC-NNDSS), while other diseases of immediate concern are reported as necessary. Guam also compiles data on additional infectious diseases in its population. Morbidity reports were tallied by hand until 1992 when the data were computerized. Guam incidence rates were calculated using the reported U.S. Census data for all Census years. Population estimates from the Guam State Data Center, Bureau of Statistics and Plans were used for intercensal years prior to 2010 and the Guam Statistical Yearbook-2016 for the intercensal years 2011-2018.1 If available, comparable U.S. incidence rates for specific infectious diseases were obtained directly from the CDC-MMWR and the searchable MMWR historical CDC stacks. All U.S. data exclude U.S. territories. For some infectious diseases, comparisons with Hawaii are included. Some of the notifiable infectious diseases have been graphed or compared with the U.S. overall (or Hawaii). Data on sexually transmitted diseases, tuberculosis, and Hansen's disease were verified with the corresponding DPHSS program(s). The data for 2000-2016 for chlamydia was obtained from the CDC, since there were inconsistencies in the Annual Summaries for this time period. Data for 2018 are preliminary and currently being verified.

Limitations

The main limitations of these data are the lack of reporting (e.g. from smaller clinics) and lack of timely reporting (e.g. from the military), even though it is required by law for all health care providers to report specified infectious diseases to the DPHSS. From 1968-1992, all data were compiled by hand and tallied at the DPHSS, with each case of infectious disease having hard copy morbidity reports and follow-up records. In recent years, morbidity reports can come in by phone, fax, or mail and can include hard copies, faxed copies, and electronic submissions (including secure email, safe access or Health Language 7 [HL7] file exchange, as well as manual entry into the

Table 1. Guam Ethnic Population by Census Year

	1980 US Census	1990 US Census	2000 US Census	2010 US Census	Guam State Data Center 2020
	Count (%)	Count (%)	Count (%)	Count (%)	Estimate (%)
Total Population	105,979 (98.6)	133,152 (100)	154,805 (100)	159,358 (100)	169,322 (100)
Total Micronesian	1,662 (1.6)	4,872 (4.1)	11,094 (8.3)	18,286 (12.7)	19,485 (12.7)
Single Ethnic Group	94,839 (89.5)	120,203 (90.3)	133,252 (86.1)	144,429 (90.6)	152,913 (90.3)
Chamorro	44,299 (41.8)	49,935 (41.5)	57,297 (43)	59,381 (41.1)	62,721 (41)
Filipino	22,447 (21.2)	30,043 (22.6)	40,729 (30.6)	41,944 (29)	44,303 (29)
White	8,442 (8)	19,160 (15.9)	10,509 (7.9)	11,321 (7.8)	11,958 (7.8)
Carolinian	34 (0)	135 (0.1)	123 (0.1)	242 (0.2)	256 (0.2)
Chuukese	97 (0.1)	1,919 (1.4)	6,229 (4.7)	11,230 (7.8)	11,962 (7.8)
Kosraean	40 (0)	101 (0.1)	292 (0.2)	425 (0.3)	449 (0.3)
Marshallese	40 (2.4)	71 (0.1)	257 (0.2)	315 (0.2)	333 (0.2)
Palauan	1,335 (1.3)	1,858 (1.5)	2,141 (1.6)	2,563 (1.8)	2,777 (1.8)
Pohnpeian	69 (0.1)	589 (0.5)	1,366 (1)	2,248 (1.6)	2,374 (1.6)
Yapese	47 (0)	199 (0.2)	686 (0.5)	1,263 (0.9)	1,334 (0.9)
Other PI	517 (0.5)	1,637 (1.4)	648 (0.5)	915 (0.6)	966 (0.6)
Other Asian	6,200 (5.9)	9,238 (7.7)	9,600 (7.2)	9,437 (6.5)	9,968 (6.5)
Other Single Ethnic	10,395 (9.8)	538 (0.4)	3,375 (2.5)	3,145 (2.2)	3,512 (2.3)
Multiple Ethnic Groups	3,390 (3.2)	12,877 (9.7)	21,553 (13.9)	14,929 (9.4)	15,769 (9.3)
Other/Unknown	7,150 (6.7)	72 (0.1)	1,807 (1.2)	404 (0.3)	427 (0.3)

National Electronic Disease Surveillance System [NEDSS] Base System [NBS]). It is anticipated that as more clinics submit reports electronically, timely reporting could become less of a problem. However, it is important to note that many morbidity reports come in by phone, and these morbidity reports are generated at DPHSS for appropriate follow-up.

An additional limitation is the compilation of data on hepatitis B and C cases. Guam appears to have high rates of hepatitis B and C compared to the U.S.; however, from 2009-2016, reported 'new' cases were included in the Guam annual summaries if they had not yet been included in the Hepatitis Registry (with data beginning in 1980). A comparison of hepatitis B and C cases recorded in the annual reports and in the current Hepatitis Registry by year provided conflicting numbers of cases, indicating that the annual summary counts are inaccurate. Since the number of annually reported cases may include chronic cases and therefore not accurately reflect new acute cases, hepatitis B and C are not included in this report. The DPHSS is in the process of updating and verifying the Hepatitis Registry. From 2017 onward, only new (acute) cases of hepatitis B and C are reported in the annual summaries.

Sexually Transmitted Diseases

For sexually transmitted diseases, gonorrhea, Guam has generally followed the overall U.S. pattern, with high rates peaking in the 1970's and then decreasing. Guam peaked later, in the 1980's, and then experienced a decrease. In both the U.S. and Guam, rates have started to increase since 2014. Gonorrhea rates were slightly lower in Guam compared to the U.S. in 2018 (122.0 per 100,000 on Guam versus 170.6 per 100,000); however, the number of gonorrhea cases continued to rise from 99 cases in 2014 to 225 in 2018, a 127 percent increase.

Guam has very high rates of chlamydia, along with increasing numbers of syphilis cases. The incidence rate of new chlamydia cases in 2017 was 675.5 per 100,000, which was higher than the U.S. rate of 524.6 per 100,000. Guam's military population is a major contributor to the high rates of sexually transmitted infections. The DPHSS is currently reviewing the data to compare the cases and incidence rates of military and civilian STDs for the years these data are available. Up until the year 2000, Guam's syphilis rate was lower than the U.S., but it is now higher and has increased in recent years. Guam has had 19 reported cases of congenital syphilis since 2001, whereas from 1968 to 2000, a span of 32 years, there was only one case of congenital syphilis reported on Guam (in 1969).

Tuberculosis and Hansen's Disease

Guam has the highest rates of tuberculosis and Hansen's disease in the U.S. for its small population, although Guam is not ranked in official CDC reports and the state of Hawaii does have similarly high rates of both tuberculosis and Hansen's disease. This is a result of the high rates of tuberculosis not only among local Chamorro and Filipino residents, but also among immigrants to Guam from the Philippines and migrants from the USAPI (mainly the Federated States of Micronesia). The incidence of tuberculosis in the Philippines is 554 per 100,000 population, 480 per 100,000 population in the Marshall Islands, and 165 per 100,000 in the Federated States of Micronesia in 2017.

From 2011-2018, Guam had a total of 558 new cases of tuberculosis diagnosed: 247 were among Filipinos (44.3%), followed by 152 Chamorros (27.2%) and 139 Other Pacific Islanders (24.9%), the majority of whom were from Micronesia.

Guam's high rate of Hansen's disease is a direct result of migrants from the Federated States of Micronesia (mainly Chuuk State). Persons born in Oceania had the highest rate of Hansen's disease diagnosis during the period 1994-2011, with an average annual rate of 556.9 cases per million population, more than 10 times the rate observed for any other region in the U.S. Ninety-seven percent of those diagnosed during the period 1994-2011 from Oceania were born in the Federated States of Micronesia or the Marshall Islands, and almost half of these persons were diagnosed in Hawaii. It is likely most others from the USAPI were diagnosed on Guam.

On Guam from 2009-2018, there were a total of 129 new cases of Hansen's disease diagnosed: 3 were Chamorro (2.3%), 5 were Filipino (3.9%), 1 was Marshallese (Republic of the Marshall Islands-RMI; 0.8%), 1 was Palauan (Republic of Palau-ROP; 0.8%), and 119 were from the Federated States of Micronesia (FSM; 92.2%). Of the 119 cases from FSM, the majority were from Chuuk State (68.9%), with another 23.3% from Pohnpei, 3.9% from Yap State, and 1.6% from Kosrae State.

Multiple-Drug Resistant Infections

Multiple resistant infections pose another challenge for Guam. Multiple resistant organisms have been reported by health providers to the Guam DPHSS since 2009, and methicillin-resistant Staphylococcus aureus (MRSA) since 1996. Comparison with the U.S. was not made since the CDC-MMWR only reports specifically Vancomycin-intermediate and Vancomycin-resistant Staphylococcus aureus. Overall patterns on Guam show a significant increase since 2009 for MRSA, which accounts for the vast majority of drug-resistant organisms, as well as increases for Acinobacter, Escherichia and Pseudomonas. Klebsiella was also on the increase from 2009-2015 but has decreased in recent years.

Dengue Fever

Guam has high rates of dengue fever for its small population, although all 41 cases in the 30 years from 1988-2018 were contracted off-island (mainly in the Philippines). Guam is at risk for dengue fever infections since dengue is endemic in places where Guam's immigrants (Philippines) and migrants (USAPI) come from, and where there is back-and-forth travel.

Leptospirosis

Until the mid-1990's, there was very little leptospirosis observed on Guam. After that point, Guam has seen several peaks in leptospirosis cases (2004, 2001, and 2015), and Guam's rate is currently higher than the U.S. and even Hawaii, for its small population.

Salmonellosis and Shigellosis

From the mid-1970's until the mid-1990's, Guam experienced high numbers of Salmonella infections. Investigations about the problem suggested that it was not primarily a result of contaminated food. Based on extensive investigations throughout the 1980's and 1990's, the evidence suggested that there were three primary modes of Salmonella infection on Guam, determined mainly by differential exposure by age: (1) infant infections via passive contact with dust and dust aerosols in the home, (2) active contact among older children through play or touching pets, and (3) accidental contact among adults (including food poisoning). Additional studies also suggested there was a positive association between increased rainfall on Guam and incidence of Salmonella infections that were seasonal, suggesting environmental soil contamination from small animals (e.g. lizards, toads). Guam's current rate of Salmonella infections is similar to the U.S.

Guam also experienced high rates of Shigella infections in the mid-1980's to the early 1990's and has shown notable decreases since then, although there has been a recent surge after 2015.

Influenza, Varicella, Measles, Pertussis and Mumps

Guam's influenza incidence rate shows numerous peaks throughout the 1970's and 1980's, decreasing in the mid-1990's, with a recent surge in the past few years.

The incidence rate for varicella (chicken pox) on Guam is slightly higher than the U.S. rate). From the 1980's the varicella rate increased until it peaked in 1995. Since then, the rate has been decreasing, except for a surge in the early 2000's.

Guam's incidence of measles has decreased since 1996. Prior to 1996, there were numerous peaks, particularly in 1984, 1991, and 1994. The incidence of pertussis on Guam prior to 1997 was lower than the U.S. rate, and there has been a recent increase since then with several peaks in 1997, 2006, and 2015.
Guam's incidence of mumps shows only two notable peaks in 1974 and 2010.

Scabies, Conjunctivitis, and Streptococcal Sore Throat

Scabies and conjunctivitis are included here, as they have been and continue to be a significant source of infections among children on Guam, along with Streptococcal sore throat, although these infections are not reportable to the CDC. Scabies incidence was quite high in the late 1970's, then decreased. Incidence increased during 1999-2002 and then decreased again. In recent years beginning in 2013-2014 to 2015-2016, the incidence of scabies increased and has recently decreased again.

Conjunctivitis infections are fairly common on Guam, but rates have not recently been as high as the 1970's to the 1990's.

Streptococcal sore throat is very common on Guam, but incidence rates have decreased since the high rates of the mid-1970's.

Summary

Guam's main infectious disease challenges include: sexually transmitted diseases, tuberculosis, Hansen's disease, multi-drug resistant infectious (mainly MRSA), as well as increased risk for arboviral diseases, which are endemic in numerous countries in the Asia-Pacific region (i.e. dengue fever). Hepatitis B and C are also known problems, but the data have not been verified for accuracy in the annual summaries and in the current Hepatitis Registry. Guam also has high rates of Streptoccocal sore throat, pertussis, shigellosis, leptospirosis, conjunctivitis, and scabies. Occasional peaks in infectious diseases like pertussis and mumps suggest the ongoing need for immunization coverage in the population.

Guam currently has CDC-funded programs to address (1) sexually transmitted diseases, (2) tuberculosis and Hansen's disease (3) vector control and food-borne illnesses, and (4) vaccine preventable infectious diseases. For the growing problem of multi-drug resistant infections, as well as other general communicable diseases, Guam is currently equipped to conduct active surveillance, yet investigative resources are limited. It is likely Guam will need to plan for potential scenarios of communicable disease outbreaks, including arboviral infections in the future, as well as plan for how to address increasing multi-drug resistant infections.

Acknowledgements:

For assistance with recent programmatic data, we thank La Donna Engichy, Health Sciences student, University of Guam (2019 volunteer); Alice M. Cuenca, Communicable Disease Control Coordinator II, Tuberculosis/Hansen's Disease Control Program; and Vince Aguon, Acting Supervisor, STD/HIV/Viral Hepatitis Program.

Authors and affiliations:

Ann Pobutsky, PhD – Territorial Epidemiologist, Guam Department of Public Health and Social Services

Stephanie Kern-Allely, MPH – CSTE Applied Epidemiology Fellow, Guam Department of Public Health and Social Services

Stephanie O'Connor – Emory University intern, Guam Department of Public Health and Social Services

Grace Valencia – CDC Coordinator I, Epidemiology and Laboratory Capacity Program, Guam Department of Public Health and Social Services

Suggested citation: Pobutsky, A., Kern-Allely, S., O'Connor, S., & Valencia, G. Government of Guam, Department of Public Health and Social Services, Office of Epidemiology and Research. Historical Summary of Reported Cases of Notifiable Diseases and Incidence per 100,000 population, Guam, 1968-2018. Mangilao, Guam, September 2019.

For more information about the data and information in this report, contact:

Ann Pobutsky, PhD
Territorial Epidemiologist
Office of Epidemiology and Research
Government of Guam
Department of Public Health and Social Services
123 Chalan Kareta, Mangilao, Guam 96913
Telephone: (671) 735-7283
Email: ann.pobutsky@dphss.guam.govReferences:

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